MONTHLY NOTICES

OF THE

ROYAL ASTRONOMICAL SOCIETY.

VOL. XXII. *Supplemental Notice.* No. 9.

On the Great Comet of 1861.* By the Rev. T. W. Webb.

Though the observations which I was able to obtain of the physical aspect of the late splendid Comet are in several respects far from complete, I am induced to beg permission to submit them to the notice of the Astronomical Society, by the conviction that, in the case of objects so ill-defined and little understood, the accumulation and comparison of evidence will be likely to lead to a more satisfactory result upon the whole than might be attained, even under the most favourable circumstances, by any one observer, unaided and unchecked by independent testimony.

The observations which follow will be rendered more conveniently intelligible, if, instead of being retained in the form of a diary, they are arranged under separate heads, corresponding with the general structure of the comet.

The same telescope was employed throughout, having an excellent object-glass by Alvan Clark, of $5\frac{1}{2}$-inches aperture and 7 feet focal length.

I. *The Nucleus.*— On the evening of June 30, when, in common with the great majority of observers, I caught the first surprising view of this grand comet, the nucleus, a mere point in the comet eye-piece, and gradually opening and softening with increase of magnifying power, was expanded with about 460 into a fine luminous disc, estimated by a very rough guess at about 2″† in diameter, having an uniformly distributed golden light, intermediate probably between that of *Venus* and *Jupiter;* and a very ill-terminated, but still definite, limb, which would, no doubt, have been much more distinctly marked at a higher altitude. It was quite circular, and showed no tendency whatever to a phasis.

* Comet II. 1861.

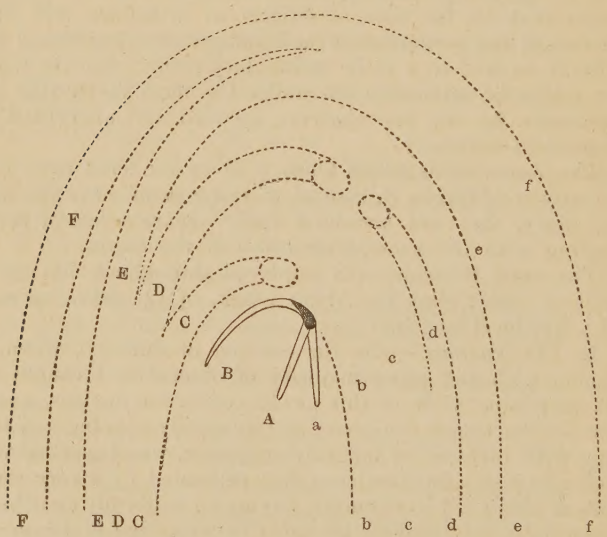
† This, I have since thought, was underrated.—T. W. W.

July 1 having been cloudy, on July 2 the nucleus was found to be equally brilliant, but already much smaller, and less abruptly distinguished from the adjacent luminosity, though the sky was not unfavourable.

July 3, in earlier twilight and a more vaporous atmosphere, the nucleus is entered as "small, dull, and ill-defined," with 460, though still a sharp and vivid point with 110.

July 4, the nucleus was estimated as not exceeding 0″·5, but this was probably in defect; and it subsequently proceeded in a course of degradation, till, on July 15, it was "extremely dim and nebulous" with 460, and even with low powers, though still vivid, was evidently losing its sharpness.

II. *The Envelopes.* — The number and complex arrangement of these luminous veils on June 30, as seen in the comet eye-piece, with a field of about 52′, and a power of 27, produced a singular as well as magnificent effect: it was as though a number of light, hazy clouds were floating around a miniature full moon. Portions of six could be more or less distinctly traced, as in fig. 1. The innermost of these (Aa in the key) was very narrow and short, faint on the left hand,



but brighter on the right in the inverted view, and coming up close to the nucleus. The second was a parabolic arc (Bb), in which the nucleus stood, but at some little distance from the vertex. The portion of it extending from the nucleus towards the inverted left, or orbitally following side, exhibited the most

vivid light of any of the envelopes, especially towards the nucleus, from which it seemed to issue straight out as an actual jet or stream, strongly luminous even with a power of 460. Its opposite branch beyond the nucleus was so much more faint and confused, that at the time its character was mistaken; it was not recognised as the prolongation of the same arc, which was erroneously, as I believe, referred to the right side (a) of the innermost envelope; nor was the mistake perceived till the next observation made the true structure of the head apparent, according to the best judgment which I could then form. It may here be remarked that these two interior veils were both in apparent contact with the nucleus, from which all the outer ones were clearly separated. The third envelope (cc) was only traceable on the left side, the opposite branch being merged in a diffuse haze. A little to the left of the probable direction of the radius vector it was kindled up into a small, bright, ill-defined cloud, more luminous than the rest of the curve, but not attaining the condensed light of the parabola next within it. The darkest portion of all the vacancies in the head was the space comprised between the left side of this envelope and the corresponding branch of the bright parabola within it, towards the visible termination of the latter. The 4th envelope (Dd) took a considerably wider sweep: on the left hand it was confounded with the previous one, but arose out of it towards its vertex, leaving an interval of fainter light: on the right hand, according to the sketch taken at the time, the envelopes 2, 3, and 4, were all merged in one continuous veil, the outer and inner boundaries of which were alone distinguishable. Somewhere near the direction of the radius vector, as conjectured from the position of the innermost envelope, there was an indentation in the parabolic outline of Dd, on each side of which there was a patch of more condensed light — that on the right was not very conspicuous, but the one to the left was much more luminous, exceeding in size and brightness the patch in the envelope Cc, and forming a striking feature in the head: a line through this patch, and that in Cc, passed far to the left of the nucleus. The 5th envelope (Ee) was a faint, narrow stream, undistinguishable from Dd to the left, but separated widely towards the right by the comparatively dark space which caused the indentation already mentioned in Dd. Ff, the 6th, a similar narrow faint stream, had a distinct existence to the left, beyond a vacant interval, but was blended with the 5th towards the vertex of the parabola. Outside of these lay a great extent of scattered nebulous light on every side, fading gradually into the clear sky. None of the six envelopes could be traced for any distance backwards, all of them becoming speedily lost in the diffused train.

Fig. 5 represents the nucleus and brilliant jet, as seen with a power of 460; sketched, however, merely from memory.

On the next night of observation, July 2, the envelopes were found to be considerably changed, as in fig. 2, and still more confused on the right or orbitally preceding side of the head. Each branch of the first or innermost envelope was now equally faint: the great curve of No. 2 had become distinctly thicker, its prolongation beyond the nucleus continuing very dim: 3 and 4 were blended into one broad veil, all the luminous patches in them had faded, and the included area had become filled with nebulous light, stronger than the remoter parts of the head; the indentation in the outer boundary of No. 4 could be still traced, and the definite outline of the vertex of this envelope, contrasted with an exterior area of comparative darkness, was one of the most remarkable features of the head. This dark space was soon lost towards the right in confused nebulosity; its left end was at first supposed to be continuous with the broad vacancy exterior to the parabolic arc No. 2; but it was subsequently thought to be cut off from it by a feeble remnant of Nos. 3 and 4. Envelopes 5 and 6 were now combined into one broad veil, which passed away into the train.

July 3. I have no note of the aspect of the envelopes, having my attention drawn to other points, in a sky full of strong twilight and haze.

July 4. There is a comparatively dark and tolerably defined space in the head, as in fig. 3, exterior to the sector now formed, about one-third of its breadth, encompassing it as far as it is distinctly marked, and prolonged a little beyond it on the lower inverted side. Outside of this vacancy all is diffuse nebulosity, with some doubtful traces of streakiness, as if envelopes still existed there, not separately distinguishable. The orbitally preceding or south side is especially confused and ill made out.

July 5. The dark area is nearly obliterated, but the coma exterior to it seems streaky, as though composed of a number of narrow veils.

July 8. No envelopes remain.

III. *The Luminous Sector or Fan.*—This, as immediately connected with the nucleus, might have been described before; but, as its formation was at first incomplete, the observations may be more intelligible from its postponement. The first indication of its existence was the very intense light of that portion of the parabolic arc, or second envelope, which seemed to issue from the left side of the nucleus. This was very conspicuous in the first observation, and probably continued traceable, with little alteration, to the last. It has been drawn in fig. 1, as represented in the original sketch, coinciding with the external edge of the parabola; but I could not be confident as to this, not having expressly attended to the point; and from subsequent appearances it is more likely that it followed the interior curve of that envelope. It had not been noticed

in sketching with the low power of the comet eyepiece, about 27, but was clearly brought out with powers of about 110, 170, 275, and even 460, as a strong curved ray or vivid stream, actually emanating from the material of the nucleus, and gradually losing itself in the envelope.

July 2. The sector was more fully developed; in the comet eyepiece it was hardly discernible from the irradiation of the nucleus; but 110 brought it out beautifully, and it was visible even with 460. It extended, as in fig. 7, through about 125°: the upper inverted edge, which was the brightest part, and barely distinguishable from the nucleus at its origin, standing at an angle of about 190°; the other edge, shorter, less defined, and apparently a little curved, at about 315°; a portion of the included area preceding the nucleus was fainter than the rest. The extent of the upper cusp towards the Sun might be $\frac{1}{7}$th of the distance from the nucleus to the indentation in the envelope No. 4.

July 3. The sector has a greater angular extent than last night, its edges standing at about 170° and 330°. It is very conspicuous in strong twilight, and has a radiated appearance, which had been suspected, but not verified, last night: the edge directed towards the Sun has lost its vivid light, and the brightest portion, which but little exceeds the rest, is a ray standing at about 225°, as in fig. 8. The edges sometimes appear a little concave.

July 4. The fan radiates like an electric brush, strongly reminding me of a similar appearance in the last return of the Comet of Halley. It must have gained considerably in breadth, as it is now well seen in the comet eyepiece. I estimate its extent at more than twice that of July 2. It is very well shown in the micrometer eyepiece, power about 55, with which some measures are attempted. The radius towards the Sun, so bright on July 2, has now become very feeble, and has also advanced in angular position, as in fig. 3; thence the area brightens to a distinct beam, with a thicker and denser extremity; next to this is a space of feeble light, running up far towards the nucleus; and, further on, the circular limb seems to be indented, so as to make the form of the north cusp sharp and long: an appearance increased by the backward curvature of the hinder boundary of the sector. But, excepting the beam with its broader end, which was sufficiently evident, these details were delicate and difficult. The measures of position, such as they were, gave for the south edge 207° (extremely uncertain), the luminous beam 251°, the north edge about 340°. The length of the beam, from its time of passage, appeared to be about $1\frac{1}{2}$ minute of arc.

July 5. The comet eye-piece showed the south edge of the fan more opened backwards, so that its position was more symmetrical; the luminous beam was broader, but less distinct.

July 8. The sector has nearly lost its circular boundary, and it fades down into the coma; but it is still visible, of a dull yellow hue, with 460: a mean of three bad measures of position gave for the south edge, 227°; for the luminous beam, 271°.

July 10. The sector seems to stand as obliquely as in the last observation; its circular boundary has disappeared, and the stronger ray is very obscure.

July 15. Hazy; sector ill-defined, visible with 460, but contracted in angle, and of a brownish yellow hue.

July 16. Much clearer; the increasing density of the adjacent coma barely leaves a separate existence to the sector, which, however, in the present sky, has recovered its angular extent.

IV. *The Coma.*—This great mist faded away so imperceptibly that no attempt could be made to sketch its boundary; but I regret that I did not endeavour to form some idea of its extent at its first appearance.

On July 4 the whole diameter of the head was very roughly estimated at 20′; July 10, 18′; July 15, 13′. My general impression, towards the close of the observations, was that it had increased in density and brightness as it diminished in extent: this seemed evidently the case on July 16, as, even with so high a power as 460, it was very conspicuous around and beyond the sector. Its most remarkable feature has been its change of colour. On June 30 the whole comet had a strong golden hue. July 10. I have entered it as distinctly white to the naked eye, and in the comet eyepiece tinged with blueish green or greenish blue. This hue was subsequently confirmed with suitable powers on the 15th, the nucleus appearing to have a greenish yellow cast. Considerable allowance must, of course, be made for the removal of the object from the ruddy vapour of the horizon, but still I think the fact of the change is at least highly probable.

V. *The Tail.*—This magnificent appendage was chiefly remarkable for its near approach to us, and consequent apparent length, being far inferior in density and definition to that of "the Donati."

On June 30 I traced it beyond the zenith, giving an extent of at least 90°. It widened out from the nucleus for some degrees, probably to a breadth of 3° or 4°, but was very undefined, and equally so on either side. The east edge appeared to strike off from the coma for a few degrees at a greater angle of divergency, but could not be traced by me as a separate branch; nor did I perceive, probably owing to the intervention of trees, the very interesting ray on that side, which, according to a communication and sketch with which I have been obligingly favoured by George Williams, Esq., of Liverpool, extended from the neighbourhood of the Comet's head as far as, and across, the stars of *Cassiopea:* the brightest part of

this beam, it is stated by the observer, was at some distance from the Comet, and it appeared to recede from it until it was altogether lost.* The main stream was considerably convex towards the west, pointing at its origin to the left of *Polaris*, and subsequently bending back so as to involve that star, which was in its centre about 11^h; but thence it appeared to the eye of another person, as well as my own, to take a fresh course, directed straight from the nucleus towards β and γ *Lyræ*, its extremity being lost in the space marked out by α *Lyræ*, β and γ *Draconis*, and δ *Cygni*. Its general aspect is represented in fig. 6. By 13^h its edge had reached *Polaris*, but moonlight then began to enfeeble it. About $11^h\,45^m$ my wife called my attention to a faint ray of perfectly similar character, stretching under the square of *Ursa Major*, about $3°$ or $3\frac{1}{2}°$ broad, having ψ *Ursæ Majoris* in its lower edge, and *Cor Caroli* about $1°$ above its upper, and traceable about half way from the latter star to *Arcturus*. It pointed to the Comet, but in the twilight no connexion could be made out. About 20^m afterwards it had risen higher, so as to stand midway between ψ and γ *Ursæ Majoris;* its further part had now become much more distinct than before, perhaps more so than any other portion of the ray, and its termination was plainly visible near ε *Böotis;* some time afterwards I could not see it. From this circumstance, and the character of its motion, opposite to that of the mass of the tail, I concluded it could be only a cirrus cloud brought up by the north-west wind, though the peculiarity of its direction caused me, fortunately, to record it; and from this impression, and my having missed the corresponding beam in *Cassiopea* (which, according to Mr. Williams, was somewhat the brighter of the two), I imagined for some time that the perspective appearance of the tail on this night did not accord with its immediate proximity, as calculated by Mr. Hind; but as the western ray was plainly seen by Mr. Williams at Liverpool about $12^h\,30^m$, passing midway between α and β *Ursæ Majoris*, and reaching down towards the head of the Comet, I think there can be little doubt that it was really a part of the tail, whose rapid motion of closing up towards the axis indicated that it was then in the act of leaving the immediate vicinity of the Earth; and thus this most interesting appulse, if not actual conjunction, appears to have been verified by positive observation. Mr. Williams also had supposed that his two rays might be only streaks of cloud, and had been induced, like myself, to record them from the peculiarity of their direction: happily the intervening distance between the observers was such as to remove any suspicion of the kind. That gentleman's sketch, I ought also to observe, gives so great a breadth and so scattered a character to the central portion of the train, that it becomes naturally connected

* A copy of the sketch accompanied Mr. Webb's paper.—Ed.

with these widely divergent lateral appendages. Under these circumstances it is not surprising that I should have failed in detecting any traces of a hollow structure, though I looked for them carefully. No anomalous ray could be perceived towards the Sun.

July 2. The tail was now slightly concave, instead of convex, towards the west; it could be traced nearly to *Wega*, or about 80°; neither of its edges was at all defined. In the comet eye-piece its central region at some distance behind the nucleus appeared slightly fainter than its sides. Its general direction to-night coincided nearly with the right (inverted) side of the innermost envelope in fig. 2.

July 4. Tail nearly straight; possibly a slight double curvature, first to the left (or west), then to the right, but it is quite uncertain. It appears more dense for some distance from the head; both sides are equally ill-defined. The nucleus seems to stand at the vertex of a wide but very ill-marked parabola, part of which is formed by the north edge of the fan, and within which was rather less light than at the sides; the coma, in passing off along each side of this space to form the train, was somewhat brighter on the north; but all this was so indistinct as to require close attention, and nothing like two separate streams could anywhere be seen, nor was there any anomalous ray.

July 5. The tail appears, as last night, a little denser at its origin on the north, or orbitally following side; and rapid cross-sweeping with the comet eye-piece detects a slightly darker interior, commencing near the nucleus, but not traceable for any considerable distance.

July 6. The tail is again slightly turned to the left.

July 8. Tail about 14° or 15°, and streaky to the naked eye. I am not sure whether I have not noticed this before. In the comet eyepiece it had a narrow ray in the centre, or rather, a little way behind the coma, I saw nothing but a faint ray, about 5′ broad by estimation, and several degrees in length. On the north side the coma passed off into a faint branch of about the same width, and perhaps 30′ long., fading gradually away; on the other side I could find nothing corresponding. Hence I concluded that this branch and the longer ray were the two sides of a hollow tail, till further examination, and especially with the finder, convinced me to the contrary. In this little instrument the whole tail rose in one stream from the whole coma; and the ray, having been previously perceived, could be seen to form its axis for some distance. Fig. 4 is the appearance in the comet eyepiece; fig. 9 that in the finder.

July 10. I studied the tail carefully, and think that I misconceived its structure the night before last: the two branches, as in fig. 4, are, after all, a double train with a darker interior. I was misled by its coming off from the coma with a sudden

turn downwards (inverted): the lower is the fainter and shorter of the two branches, reaching about 2°; the other is much the longer; it is broader than on the 8th, but, notwithstanding a very transparent sky, less defined. There is no other branch on the opposite side, and it is obviously the edge, and not the centre of the tail. Fig. 4 still suits it well: a very careful scrutiny with the finder detects no central ray. The bend downwards is very visible with this little glass, and perceptible to the naked eye.

July 15. Powers of 55 and 110 showed no dark interior, but it could be distinctly made out in the comet eyepiece, though not near the nucleus, and could be traced for about 1°. The streams on each side were nearly alike — possibly the orbitally preceding may be the more dense; the head still seemed, as it were, set on a little awry.

July 16 and 23. Hollow structure difficult to be perceived.

A few general remarks may be permitted at the close of these observations.

It may fairly be inferred, from the absence of any phasis, that the visible nucleus either contained no concentration of opaque matter, or shone by intrinsic light. Its axial rotation seems improbable, if, as may reasonably be supposed, the more luminous rays always issued from the same portions of it. On the other hand, some amount of libration might be deduced from the varying angles of position of certain portions of the sector, if only the measures could be thought worthy of sufficient confidence.

The similarity of the brilliant jet of June 30 to the streams which issued from the nucleus of Halley's Comet in 1835 is as obvious as that of the subsequently formed sector to some of the phenomena of the Comet of Donati; and the unsymmetrical arrangement, so evident in 1858, was again conspicuous. The sector was of later date than the envelopes, and much posterior to the perihelion passage. The descent of the envelopes upon the nucleus in the Comet's retreat from the sun corresponded with the similar process described by Herschel and Schröter in 1811; and this probably may have been the cause of the increasing apparent density of the whole coma.

There were no indications of rotation in the tail. Any general curvature which it may have possessed was masked by its position; but minor deviations in direction were sufficiently evident.

The obliquity of the sector and envelopes with respect to the axis of the tail might be thought to indicate that a stronger repulsion or a less resisted emissive force acted in one direction from the nucleus than in the opposite. The nebulous veils, without any difference as to extent, showed invariably greater distinctness and definedness on one side of the head than on the other. Unfortunately the position of the Comet's orbit

was such during these observations that it was not possible to obtain a fair view of the arrangement in the plane of its motion, or to form a satisfactory idea how far these phenomena may have arisen from any external resistance.

Hardwick Parsonage, December 24th, 1861.

Comet I., 1862.

The Comet appears to have been first observed by Mr. Schmidt, at Athens, about half-past ten on the evening of July 2, near the stars β, ϱ, σ, *Cassiopeiæ*. It was seen about midnight by M. Tempel, at Marseilles, and by Mr. Bond, at Harvard College, on the evening of July 3d (see *Ast. Nach.* Nos. 1369, 1370, and 1374). Elements have been computed by Dr. Seeling, Mr. Hall, Mr. H. P. Tuttle, and Dr. Weiss; those of Dr. Weiss, computed from the Athens and Marseilles Observations of July 2, 3, 5, are as follows:—

T = June 22·5430 G.M.T.

Ω = 324 30·4 } Mean Eq.
Π = 298 35·2 } 1862·0.

i = 8 14·2

$\log q$ = 9·99242.

Motion retrograde.

Comet II., 1862.

The Comet was discovered by MM. Pacinotho and Toussaint, at Florence, on the 22d July (*Ast. Nach.* No. 1374). The elements, as calculated by Dr. Hornstein, from observations of July 24, 27, and August 1, are as follows:—

T = 1862, Aug. 23·71395, Berlin M.T.

Ω = 137 4 32·8 } Mean Eq.
Π = 344 16 13·6 } 1862·0.

i = 66 3 4·1

$\log q$ = 9·9847732.

Motion retrograde.

Communications in reference to this Comet have been received from C. B. Chalmers, Esq., and Lieutenant Chimmo. Mr. Chalmers (Shanty Bay, County of Simcoe, Canada West), with his 5-foot equatoreally-mounted telescope by G. Dollond, saw the Comet, August 11, about 10 P.M., in the constellation *Camelopardus;* approximate Declination + 80° 51′, Comet moving north at the rate of about 50′ in twenty-four hours; there was no tail, but a rather extensive coma; the nucleus bore a faint illumination of the wires.

Lieut. Chimmo (Canna Island, Hebrides, lat 57° N., long. 6° 30′ W.) observed the Comet on the night of Sept. 1, about $9^h\ 51^m$ G.M.T. He observed the distances of the Comet from

Ursa Major α	67	5′	30″
Ditto η	39	58	30
Arcturus	73	39	30
α Lyræ	41	22	30

from which the position is laid down on a drawing which accompanied his letter. The altitude was 25° 48′ 30″.

The Moon had just set, and the Comet's position was made under the disadvantage of a bright Aurora, which was coruscating towards the zenith, from an arch of about 14° elevation, from N.N.W. to N.N.E. (mag.)

The tail of the Comet was inclined to the E.S.E. (mag.), and measured (with unassisted vision) half a degree nearly, or about equal to fifty millions of miles.

The nucleus was well defined, and equal to a star of the third or fourth magnitude, surrounded by considerable nebulosity of an irregular oval, perhaps paraboloidal. The jet apparently waved to and fro: this is however doubtful, and it may be an illusion, caused probably by the shooting coruscations of the Aurora.

The most attractive feature of the Comet was the well-defined limb of the south or underneath portion of the tail.

The instruments used were a common 3-foot telescope of 1·6 field, and a sextant, being all that the observer had; but there was the assistance of a pure and transparent atmosphere.

Hansen's Tables de la Lune.

A list, containing all the Errata discovered in the above Tables at the *Nautical Almanac* Office, and otherwise known at the Royal Observatory up to the date of March 10, 1862, has lately been issued in the form of a *Nautical Almanac*

Circular, and distributed from the Royal Observatory. All possessors of the Tables who have not received a copy of this list may obtain it on application to the Royal Observatory, Greenwich, or to the sources from whence they received the Tables.

Death of Capt. Jacob.

The Council have great sorrow in notifying to the Fellows of the Society the decease of Capt. Jacob, within a few days after his arrival in India, and that the important expedition on which he had set out is thereby brought to a most unexpected and unfortunate close. As the next Annual Report will contain fuller particulars of his life and labours, and in particular of this the closing event, the Council now confine themselves to stating that Capt. Jacob sailed from England in the Hertfordshire, by way of the Cape, on the 20th of April last; and after enjoying good health on the voyage, landed at Bombay on the 8th of August, with a slight cold, which appears from the accounts received to have been increased during the exertions of superintending the landing of his family and instruments. He proceeded, however, within two or three days to his destination, Poonah, where medical aid was called in, in consequence of an abscess in the throat and an attack of inflammation of the liver which had supervened. Leeches were very freely applied; and it is fruitless now to remark further than that, on the 16th, this admirable observer and excellent man was no more.

Another severe loss has been incurred by the decease of an Associate of the Society, the veteran Astronomer Carlini, who died in his 77th year, after a short but painful illness, on the 29th of August, 1862. An account of his life and scientific labours (carried on with unbroken activity for nearly sixty years) will be given in the ensuing Annual Report.

Mr. Dawes calls attention to some typographical errors in his paper, "Saturnian Phenomena," as printed in the last number of the *Monthly Notices*, viz., page 297, line 16 from the bottom, the word "*side*" should be in Roman letters, and page 298, line 7, the word "ring" should be in Italics; and line 38, the word "damp" should be "dense," the conjecture referred to being *the existence of a pretty dense atmosphere on the rings.*

INDEX.

Page

Abbott, F., on the transit of *Mercury*, Nov. 12, 1861, observed at Hobart Town 235
Adams, J. C., observations of Comet II. 1861, made with the Northumberland Equatoreal at the Cambridge Observatory 267
Address on delivering the gold medal to Mr. De La Rue 131
Airy, G. B., note on a letter from Prof. Hansen 3
——, ——, on a result deduced by M. D'Abbadie from observations of the total solar eclipse of 1860, July 18 ..... ib.
——, ——, on the circularity of the sun's disk 80
——, ——, table of comparative numbers of observations of small planets 84
Argelander, Dr., notice of the progress of his charts 57

Associates deceased:—
Daussy, P. 21, 113
Biot, J. B. 114
Carlini .....

Associate elected:—
Delaunay, M. Charles 141

Attractions, mountain 242
Auwers, M. A., letter to the Rev. R. Main, on the irregularity of the proper motion of *Sirius*, and on a missing nebula . 148
———, ——, ditto, on the orbit of *Procyon*, and on the positions of the Radcliffe Catalogue 150

Baxendell, J., the transit of *Mercury*, Nov. 11, 1861, at Manchester .. 42
———, —, on the elements of the variable star R *Sagittæ* 44
Birt, W. R., description of a portion of the lunar surface, as seen at Dr. Lee's Observatory at Hartwell, on the morning of July 31, 1861 8
——, ——, the lunar crater *Plato* 11
——, ——, on an instrument for comparing colours, proposed to be designated a homochromascope ..... ib.
——, ——, on a rediscovery of the missing lunar crater *Alhazen*, situate on the western border of the *Mare Crisium* 229
——, ——, on the appearance of *Saturn's* ring, May 13, 1862..... 295
Bohn, H. G., presents by him to the Society 170
Bond, G. P., observations and elements of Comet III. 1861, communicated by 94
Breen, J., orbit of ξ *Ursæ Majoris*, determined from the observations made between 1819·10 and 1860·08 158
Bulard, M., observations of transit of *Mercury*, solar eclipse, and occultation of *Venus* 154
Burr, T. W., occultation observed at Highbury 15, 166
——, ——, description of a new aplanatic eye-piece for telescopes 290

Page

Carrington, R. C., on the progress of Dr. Argelander's charts 57
————, ——, further note on the supposed observation of an intra-Mercurial planet, on the 12th Feb. 1820, from Dr. von Littrow to 276
————, ——, account of his process for obtaining the corrections required by his provisionally assumed elements of position of the solar equator 300
Cayley, A., on the secular acceleration of the moon's mean motion (abstract) 32
———, —, ditto, *in extenso* 173
———, —, note on a theorem of Jacobi's, in relation to the problem of three bodies 76
———, —, a third memoir on the problem of disturbed elliptic motion (abstract) 79
———, —, on Lambert's theorem for elliptic motion..... 238
Chacornac, M., on the missing nebula in *Coma Berenices* 277
Chevallier, Prof., the transit of *Mercury*, Nov. 11th, 1861, at Durham 39
Clock, on a new observing 19
Comet, Encke's, observed at Hartwell 60
——, ———-, ditto, at Liverpool..... 238
——, -———, ditto, at Sydney 272
Comet III. 1860, observations of, Sir T. Maclear 18
Comet I. 1861, Sir T. Maclear's observations..... 169

Comet II. 1861, observations of
Mansell, near Sidon 15
Edmondson, Armagh 17
Krabbe, Ascension Island 18
Hough, Dudley Observatory ..... ib.
Hartnup, Liverpool..... 46
Main, Oxford 50, 94
Struve, Pulkowa 242
Adams, Cambridge 267
Physical observations of, Mr. Webb 305

Comet II. 1861, and other comets 160
Comet III. 1861, observations and elements of, Mr. Bond 94
Comet I. 1862, discovery and elements 314
Comet II. 1862, ditto ditto and observations..... ib.
Cooper, B. H., letter on the Egyptian Phœnix period..... 59

D'Abbadie, on a result deduced by him from observations of the total solar eclipse of July 18th, 1860, Mr. Airy..... 3
Dawes, Rev. W. R., transit of *Titan's* shadow across the disk of *Saturn*, on the 15th April, 1862..... 264
——, ————, ditto, on the 1st May, 1862..... 266
——, ————, ditto, on 17th May 267
——, ————, on the appearance of *Jupiter* without a visible satellite, Sept. 1843 291
——, ————, Saturnian phenomena 297
De La Rue, on heliotypography..... 278
Disturbed elliptic motion, Mr. Cayley's third memoir (abstract) 79

Edmondson, Mr., places of Comet II. 1861 17
Ellery, —, transit of *Mercury*, of Nov. 11 (12), 1862, at Victoria 84
Errata and rectifications 27, 96, 276, 316
Eye-piece, Mr. Burr's new aplanatic 290

Fellows deceased: —
Bishop, Geo. 104
Cubitt, Sir W..... 106
Ellis, T. F. ..... ib.

Page

Fellows deceased (*continued*) :—
Fitton, Dr. 107
Foster, T. J. M. 107
Murray, Sir W. Keith 108
Pasley, General Sir C. W. 110
Wilson, W. 111

Fellows elected :—
Becket, J. F. 229
Breen, James 69
Cockburne, Hon. Samuel 97
Cole, J. J. 141
Cottam, Arthur 97
Crofton, Rev. Edward 141
Cross, Rev. J. E. 261
Dollond, George 97
Elliott, Rev. E. K. 229
Glennie, J. S. S. 261
Kidd, John 69
Lake, C. H. ..... ib.
Lockyer, Norman 141
Lynn, Wm. Thynne 97
Martindale, N. 229
Mason, Charles 97
M'Dowell, James 69
Miller, S. H. 261
Morton, Rev. J. 229
Newton, John 261
Pyne, Rev. Thomas 69
Robertson, John 281
Sargent, Rev. John 29
Schaffner, Col. T. 1
Smith, D. 281
Vertu, Signor Julian 69
Worms, Henry 29
Wray, William 69

Gauss, M., notice as to his collected works 141
Gilliss, Lieut. J. M., opposition of *Mars*, 1862 250
Gorton, S., his drawings of *Jupiter* 60
———, —, transit of *Titan's* shadow 294
Greenwich observations of minor planets, occultations, and phenomena of *Jupiter's* satellites .. 12, 49, 87, 164, 236, 273, 289

Hansen, Prof., on his lunar tables, extract of a letter to the Astronomer Royal 1
———, ——, his Tables de la Lune, list of errata given in *Nautical Almanac* Circular 315
Hartnup, J., the transit of *Mercury*, Nov. 11th, 1861, at Liverpool 41
———, —, observations of Comet II. 1861 46
———, —, observations of Encke's Comet 238
Hardy, R. W. H., the solar eclipse of the 31st Dec. 1861, observed at Bath 90
Heliotypography, Mr. De La Rue 278
Herschel, Sir John, letter from, to Mr. Hind, on the disappearance of a nebula in *Coma Berenices* 248
Hind, J. R., total solar eclipse, Dec. 31st, 1861, by 6
——, ——, note on a dark circular spot upon the sun's disk, with rapid motion, as observed by W. Lummis, of Manchester, March 20th, 1862 232
Hodgson, R., on a solar spot 299
Hoek, M., ephemeris of *Proserpine* (26) 275

Page

Homochromascope, proposed new instrument 12
Horton, S., observations of Encke's comet and of *Saturn* 60
Hough, G. N., observations of Comet II. 1861, occultation, and minor planets, at the Dudley Observatory 18
Howlett, Rev. F., observations of solar spots 6
Huggins, W., on the periodical changes in the belts and surface of *Jupiter* 294
———, —, on some phenomena attending the disappearance of *Saturn's* ring, 19th May, 1862 295

India, Government grant for a Hill Observatory in 29
——, great trigonometrical survey of, new instruments for 261

Jacob, Capt., note on two drawings of *Saturn* 89
——, ——, his death 316
Jacobi, note on a theorem of 76
Jeanjaquet, E., considerations on the solar spots 233
Jeans, J. W., the transit of *Mercury*, Nov. 11th, 1861, at Grantham .. 42
Jee, M., the transit of *Mercury*, Nov. 11th, 1861, at Liverpool 41
Joynson, J., the transit of *Mercury*, Nov. 11th, 1861, at Liverpool ... ib.
Jupiter, Mr. Gorton's drawings of 60
———, periodic changes in the belts and surface of 294
Jupiter's satellites, Greenwich observations of phenomena of 14, 50, 87, 165, 238, 274, 290
———————, observations of, Mr. Talmage 287
Jupiter without a visible satellite 292

Knott, G., on the variable star R *Vulpeculæ*, by 45
——, —, on the stars R *Vulpeculæ* and U *Geminorum*, and on an appearance in *Venus* 157
Krabbe, J. F., notice of observations of Comet II. 1861, at Ascension Island 18

Lambert's theorem, note on 238
Lassell, W., the transit of *Mercury*, Nov. 11th, 1861, at Malta 38
———, —, extract of a letter from, on the erection of his equatoreal, and on the nebula of *Orion* 162
———, —, correction of an error 276
Le Verrier, U. J., his researches on the system of the planets *Mercury*, *Venus*, the Earth, and *Mars* 257
Lummis, W., note on his observation of a spot on the sun's disk 232
Lunar surface, craters, &c.:—
Description of a portion of 8
Plato, observations of 11
Alhazen, rediscovery of 229
Lunar theory, letter from Prof. Hansen 1
———————, secular acceleration, Mr. Cayley 32, 173

Mackay, Dr., on Comet II. 1861, and some other comets 160
Maclear, Sir Thomas, notice of observations of Comet III. 1860, made at the Cape of Good Hope, by 18
———, ———, observations of Comet I. 1861, at ditto 169
Main, Rev. R., observations of Comet II. 1861, at the Radcliffe Observatory 50
——, ———, additions and corrections of the observations of Comet II. 1861 94
——, ———, disappearance of B.A.C. 4923, at the moon's dark limb, 9th June, 1862 287
Mansell, Commander A. L., sextant observations of Comet II. 1861 .. 15
Mars, the approaching opposition of 1862 ..... 250, 281

Page

Mercury, transit of, 1861, Nov. 11, observations of:—
Adelaide, Mr. Todd 267
Algiers, M. Bulard 154
Durham, Prof. Chevallier 39
Grantham, Mr. Jeans 42
Hobart Town, Mr. Abbott 235
Liverpool, Mr. Hartnup and others 41
Malta, Mr. Lassell 38
Manchester, Mr. Baxendell 43
Rome, Father Secchi 37
Sydney, Mr. Scott 88
Williamstown, Mr. Ellery ..... ib.

Minor planets, table of comparative number of observations of 84

Minor planets, Greenwich observations of:—
Amphitrite (29) 237, 274
Ariadne (43) 13, 49
Bellona (28) 13
Calliope (22) 13
Calypso (53) 165
Eunomia (15) 165, 237
Europa (52) 13, 50, 87
Euterpe (27) 274, 290
Flora (8) 236, 273, 289
Fortuna (19) 273
Hebe (6) 289
Irene (14) 12, 49, 87
Iris (7) 12
Massilia (20) 290
Melpomene (18) 273, 290
Metis (9) 164, 237
Nysa (44) 13
Niobe (72) 14
Phocea (25) 12
Pseudo-Daphne (56) 14
Psyche (16) 237
Thalia (23) 165, 237, 274
Urania (30) 13
Victoria (12) 49, 87

Minor planets, other observations:—
Calliope (22) 19
Feronia (72), discovery and elements of 171
Proserpine (26), ephemeris of 275
Themis (24) 19

Miscellaneous intelligence 27, 316

Nebulæ, supposed missing, Hind's nebula of 1852 150
———, ———————, in *Taurus* 242
———, ———————, *Coma Berenices* 248, 277
Nebula of *Orion*, on a new star in 161
Neptune, on the mass of 142

Observatory, Indian Hill, Government grant for 29
———————, Sydney, new determination of the longitude of 159

Page

Observatories, account of the proceedings of:—
Greenwich, Royal Observatory ... 114
Edinburgh, Royal Observatory ... ib.
Radcliffe ... 116
Cambridge ... 117
Glasgow ... 119
Liverpool ... 118
Hartwell, Dr. Lee ... 120
Kew ... ib.
Cranford, Mr. De La Rue ... 121

Occultation of *Venus* by the moon ... 154
Occultations of stars by the moon ... 15, 19, 93, 166, 287, 289
———————————, observed at Greenwich 14, 50, 165, 237, 274
Orion, on a new star in the nebula of ... 161

Peters, Dr., on the minor planet *Feronia* (71) ... 256
Pogson, N., ephemeris of the long-period variable stars for 1862 ... 155
———, —, contemplated celestial survey of the Southern heavens ... 301
Powell, E., variations in the light of *η Argus* at Madras, from 1853 to 1861 ... 47
Procyon, on the orbit of ... 150

Radcliffe Catalogue, on the places of:—
Dr. Wolfers ... 30
M. Auwers ... 150

Radiation, solar, Mr. Waterston's observations of ... 60
Recent Publications ... 21, 171, 259, 302
Rümker, his manuscripts ... 278

Safford, T. H., on the perturbations of *Uranus* and the mass of *Neptune*, by ... 142
———, ———, on the proper motion of *Sirius* in declination ... 145

Saturn, his ring and satellites:—
Note on two drawings of *Saturn* ... 89
Observations of the ring ... 287, 295
Satellites ... 264, 266, 267, 294, 295
Saturnian phenomena ... 297

Scott, W., transit of *Mercury*, of Nov. 11 (12), 1861, at Sydney ... 88
——, —, new determination of the longitude of the Sydney Observatory ... 159
——, —, observations of Encke's comet at the Sydney Observatory .. 272
Secchi, Father, the transit of *Mercury*, Nov. 11, 1861, at Rome ... 37
Sirius, on the proper motion of ... 145, 148
——-, discovery of a companion of ... 170
Smyth, Prof. C. P., on a new observing clock ... 19
———, ————, on the proposed parallax observations of *Mars* in 1862 ... 281
Society, report of the Council to the forty-second annual general meeting ... 97–125
———, list of papers read before the Society from Feb. 1861 to Feb. 1862 ... 126–129
———, library of, list of contributors to ... 129–131
———, President's address on delivering the gold medal to Mr. De La Rue ... 131–140
———, officers and council for 1862–63 ... 140
Solar eclipse, 1860, July 18, on a result deduced by M. D'Abbadie ... 3
————, —, Dec. 31, table by J. R. Hind ... 6
————, ——, ———-, observations of, Mr. Hardy ... 90

Page
Solar eclipse, 1860, July 18, observations of, Mr. Talmage 91
———, ——, ———-, ————, M. Bulard 154
———, ——, ———-, in Senegal, by French naval officers 166
Solar radiation, Mr. Waterston's observations of 60
Solar spot or spots, Mr. Howlett's observations of 6
————————, on a dark circular spot with rapid motion, observed by Mr. Lummis 232
————————, considerations on, M. Jeanjaquet 233
————————, observation of a, Mr. Hodgson 300
Southern heavens, extension of survey of 301
Stars, variable, ephemeris of long-period, for 1862, Mr. Pogson 155
——, ———-, R *Sagittæ* 44
——, -———, R *Vulpeculæ* 45, 157
——, — ——, *n Argus* 47
——, ———-, R *Vulpeculæ* and U *Geminorum* 157
——, -———, R *Vulpeculæ* and others 285
Strange, Lieut.-Col. A., notice of three papers by 20
———, ————, announcement of instruments about to be supplied to the Great Trigonometrical Survey of India 261
Struve, M. Otto, on the missing nebula in *Taurus*, on Comet II. 1861, and on mountain attractions 242
———, ———-, appointed to the directorship of the Observatory of Pulkowa 248
Sun, on the circularity of the disc of 80
——, on the position of the equator of 301

Talmage, C. G., the solar eclipse of the 31st Dec. 1861, observed at Nice 91
———-, ——, occultations of stars by the moon 93
-———, -——, observations of *Jupiter's* satellites and *Saturn's* ring, and occultation of a star by the moon 287
Todd, Mr., transit of *Mercury*, 11th Nov. 1861 ..... 88, 267

Uranus, on the perturbations of 142
ξ Ursæ Majoris, on the orbit of 158

Venus, occultation by the moon 154
——, on an appearance in 157

Waterston, J. J., an account of observations on solar radiation, with appendix, describing the method 60
Webb, Rev. T. W., on the Great Comet of 1861 305
Winnecke, letter to the Rev. R. Main, on some variable stars 285
Wolfers, Dr., on the right ascensions and declinations of the Radcliffe Catalogue 30

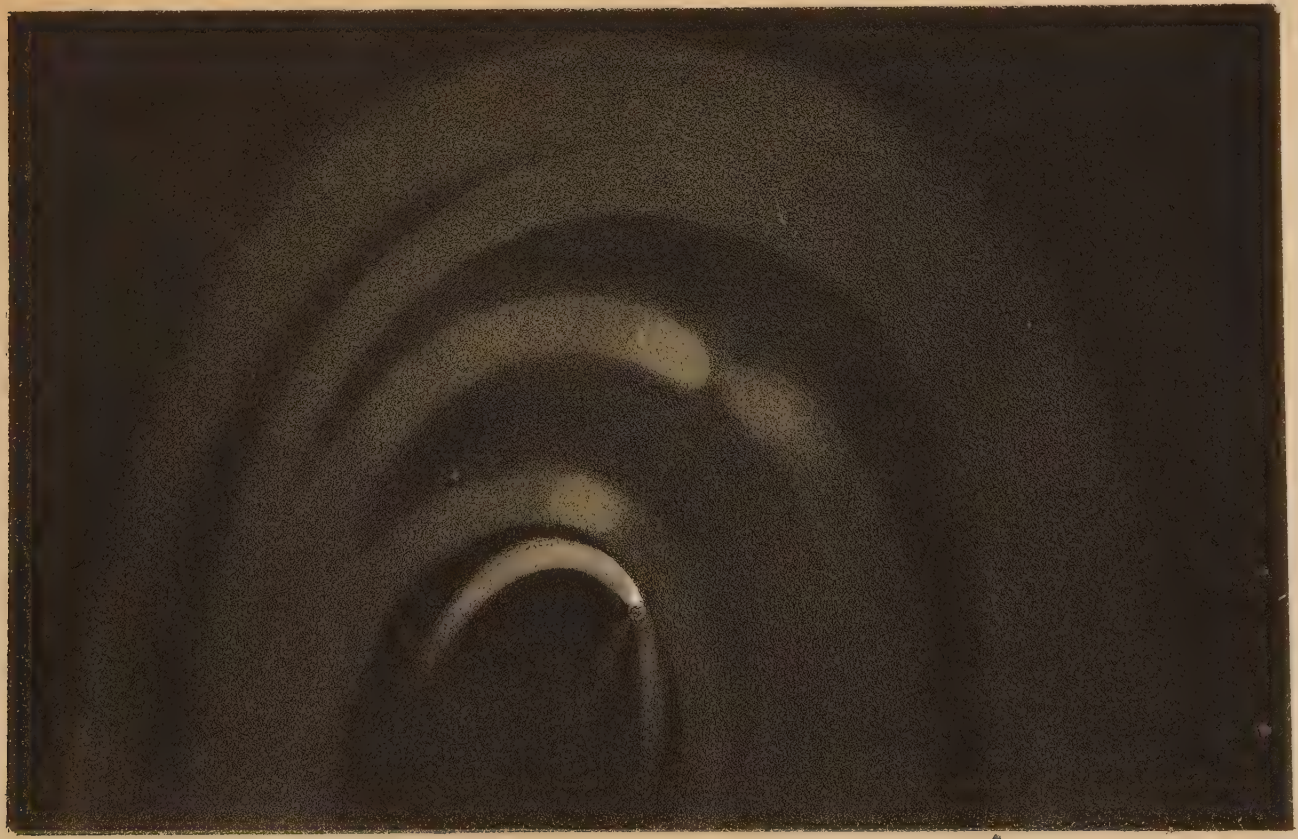
Yeates, A., notice of his paper on astronomical refraction 170

CONTENTS.

	Page
On the Great Comet of 1861, by the Rev. T. W. Webb	305
Comet I. 1862	314
Comet II. 1862	ib.
Hansen's Tables de la Lune, errata in	315
Death of Capt. Jacob	316
Death of Carlini	ib.
Corrections to a paper by Mr. Dawes	ib.
Index	317

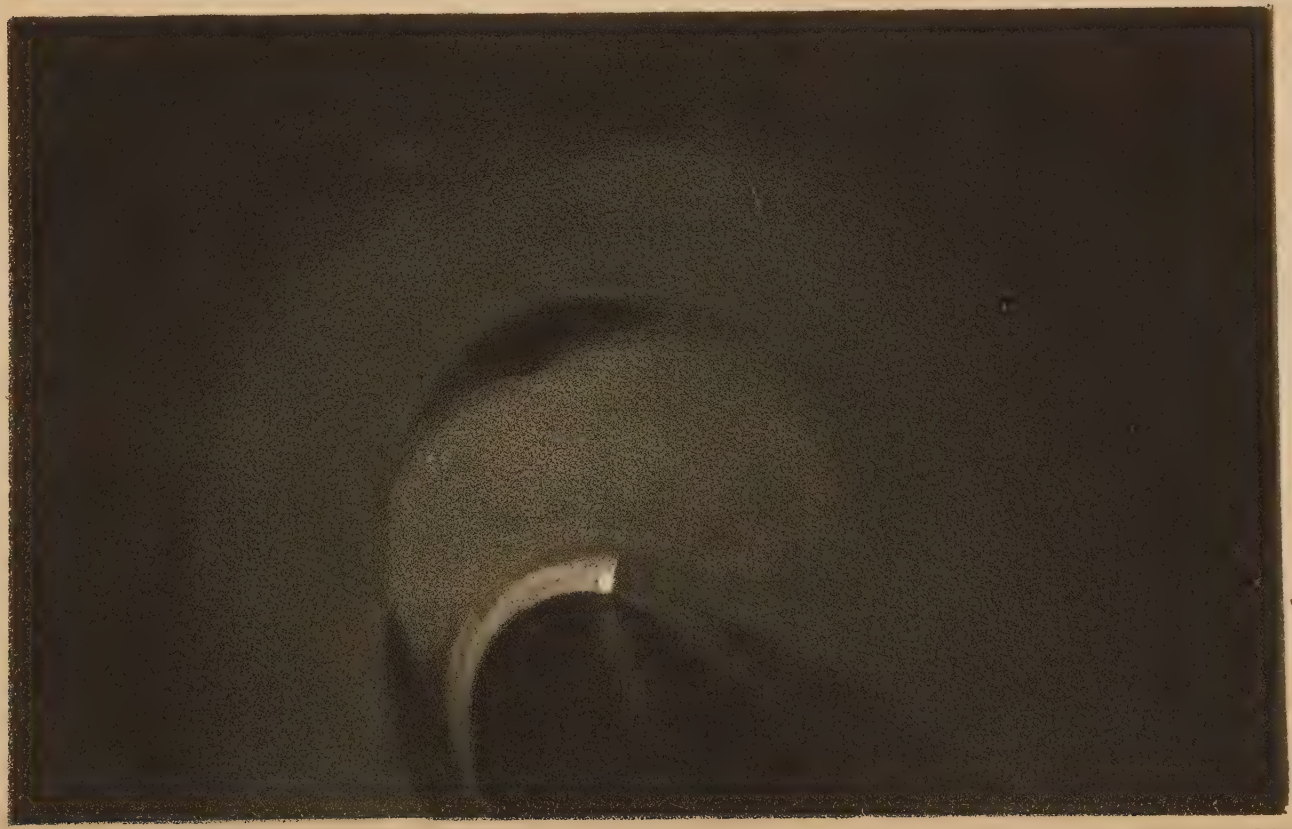
Printed by STRANGEWAYS and WALDEN, Castle St. Leicester Sq., and Published at the Apartments of the Society, Nov. 10, 1862.

I.



Malby & Sons, Lith.

II.



Malby & Sons, Lith.

IV.

July 8. 1861.

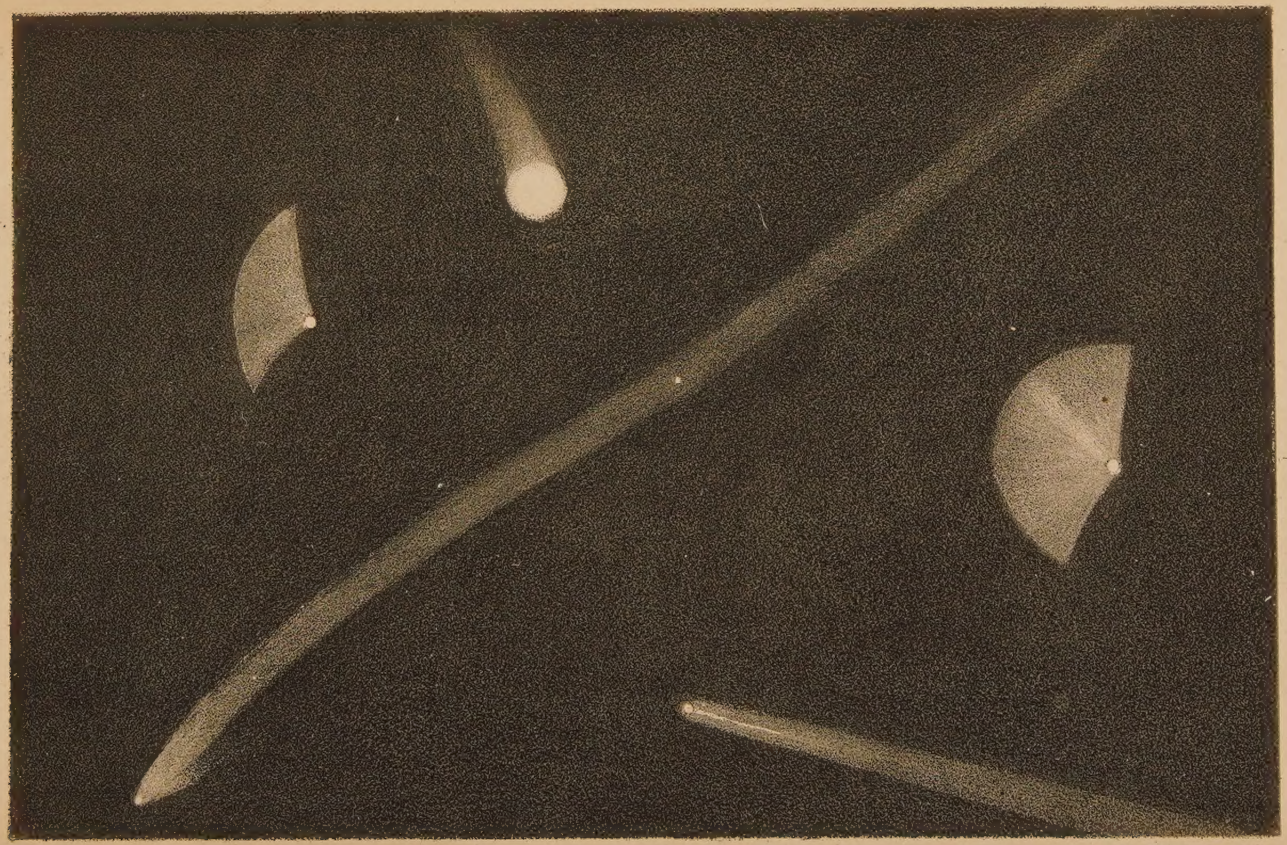
III.

Malby & Sons, Lith.

July 4. 1861.

V.

VII.



VIII.

VI.

IX.

Malby & Sons, Lith.